

Tetanus

(Also known as Lockjaw)

REPORT IMMEDIATELY

Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Tetanus is caused by a potent exotoxin produced by *Clostridium tetani*, a spore-forming, anaerobic, gram-positive bacillus.

B. Clinical Description

Generalized tetanus is an acute, often fatal neurologic disease characterized by painful skeletal muscular contractions. The toxin blocks signals through nerves that signal muscles to not contract in response to voluntary contractions of opposing muscles. The autonomic nervous system may also be affected. Onset is gradual, occurring over 1–7 days. Usually, the muscle stiffness first involves the jaw (lockjaw) and neck, and then progresses to severe generalized muscle spasms, which are frequently aggravated by any external stimulus. Severe spasms persist for one week or more and subside over a period of weeks in those who recover. *C. tetani* is a non-invasive wound contaminant; it causes neither tissue destruction nor an inflammatory response.

Neonatal tetanus, which arises from contamination of the umbilical stump, is a form of generalized tetanus. However, inability to nurse is the most common presenting sign. Localized tetanus is manifested by local muscle spasms in areas contiguous to a wound, although history of an injury or an apparent portal of entry may be lacking. Cephalic tetanus is a rare form of the disease, occasionally occurring with otitis media in which *C. tetani* is present in the flora of the middle ear or following injuries to the head. There is involvement of the cranial nerves, especially in the facial area.

Complications of the disease include: laryngospasm (spasm of the vocal cords) and/or spasm of the muscles of respiration, leading to interference with breathing; fractures of the spine or long bones, which may result from sustained contractions and convulsions; and hyperactivity of the autonomic nervous system, which may lead to hypertension and/or an abnormal heart rhythm. Other complications may include increased susceptibility to nosocomial infections, pulmonary embolism (particularly in drug addicts and elderly patients), and aspiration pneumonia. The case-fatality rate ranges from 10–90%; it is highest in the elderly and in unvaccinated persons. The case-fatality rate also varies inversely with the length of the incubation period and the availability of experienced intensive care unit personnel and resources. In about 20% of tetanus deaths, no obvious pathology is identified, and death is attributed to the direct effects of tetanus toxin.

Due to the extreme potency of the tetanus toxin, tetanus disease does not result in immunity. Active immunization with tetanus-containing vaccine should begin or continue as soon as the person's condition has stabilized.

C. Vectors and Reservoirs

C. tetani is a normal inhabitant of soil and the intestinal tracts of animals and humans. It is ubiquitous in the environment, especially where contamination by excreta is frequent.

D. Modes of Transmission

There is no person-to-person transmission of tetanus. Wounds, both major and minor, recognized or unrecognized, are the sites at which the organism enters, multiplies, and produces toxin. Cases of tetanus have followed injuries considered too trivial for medical consultation.

In recent years, a higher proportion of cases have had minor wounds, probably because severe wounds are more likely to be properly managed. Tetanus may follow elective surgery, burns, deep puncture wounds, crush wounds, otitis media, dental infections, animal bites, abortion, and pregnancy.

E. Incubation Period

The incubation period ranges from 2 days to months, with most cases occurring within 14 days. In neonates, the incubation period is usually 5–14 days. In general, shorter incubation periods are associated with more heavily contaminated wounds, more severe disease, and a worse prognosis.

F. Period of Communicability or Infectious Period

There is no infectious period as tetanus is not transmitted from person to person. Tetanus is the only vaccine-preventable disease that is not contagious.

G. Epidemiology

Tetanus occurs worldwide and is more common in agricultural regions and in areas where contact with animal excreta is more likely and immunization is inadequate. In 2001, an estimated 282,000 people worldwide died of tetanus, most of them in Asia, Africa, and South America. In rural and tropical areas, people are especially at risk, and neonatal tetanus is common.

Tetanus is sporadic and relatively uncommon in the U.S. and in most industrial countries, mostly because of widespread use of tetanus toxoid as part of routine immunization and improved wound management. Since 1995, 50 cases of tetanus have been reported annually in the U.S. Almost all reported cases have occurred in individuals who had never been vaccinated or who completed a primary series but had not had a booster dose in the preceding ten years. Ninety percent of cases who were seen acutely did not receive the appropriate treatment.

Heroin users, particularly those who inject themselves subcutaneously with quinine-cut heroin, appear to be at high risk for tetanus. Quinine is used to dilute heroin and may actually favor growth of *C. tetani*.

During 1998–2000, acute injuries or wounds such as punctures, lacerations, and abrasions accounted for 73% of reported cases of tetanus in the U.S. People employed in certain occupations have an increased risk for puncture wounds, lacerations, and abrasions. In addition, tetanus affects primarily older adults. The last reported case of neonatal tetanus in the U.S. occurred in 1998 in Montana in a newborn whose umbilical stump had been treated with a non-sterile clay. The last reported case of tetanus in Massachusetts was in 1996 in a 38-year-old house painter whose last dose of tetanus-containing toxoid was more than ten years previous to his infection via a puncture wound to the foot.

H. Bioterrorist Potential

This pathogen is not considered to be of risk for use in bioterrorism.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspect or confirmed case of tetanus, as diagnosed by a health care professional.

Note: See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

There are no laboratory findings characteristic of tetanus, and the diagnosis does not depend on bacteriologic confirmation. The diagnosis is entirely clinical by excluding other possibilities, including hypocalcemic tetany, phenothiazine reaction, strychnine poisoning, and hysteria. *C. tetani* is recovered from the wound in only 30% of cases, and it is sometimes isolated from patients who do not have tetanus.

Sera collected before human tetanus immune globulin (TIG) is administered can support the existence of susceptibility if the result demonstrates very low or undetectable anti-tetanus antibody levels. However, tetanus can occur in the presence of “protective” levels of antitoxin (>0.1 IU by standard enzyme immunoassay [EIA]); therefore serology can never exclude the diagnosis of tetanus.

The MDPH State Laboratory Institute (SLI) does not provide testing services for tetanus diagnosis.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- ◆ To assure early evaluation, and where appropriate, treatment with tetanus-diphtheria toxoid (Td) and/or tetanus immune globulin (TIG) and hospitalization.
- ◆ To identify groups and areas in which risk of disease is highest (due to under-immunization, occupation, other practices, etc.) so that prevention efforts can be focused.

B. Laboratory and Health Care Provider Reporting

Tetanus is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report by telephone to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of tetanus, as defined by the reporting criteria in Section 2A.

Due to the potential severity of tetanus, the MDPH requests that information about any case be immediately reported by telephone (24 hours a day, 7 days a week) to a MDPH immunization epidemiologist at the MDPH Division of Epidemiology and Immunization by calling (617) 983-6800 or (888) 658-2850.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *C. tetani* infection shall immediately report such evidence of infection, directly by phone, to the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities

Reporting Requirements

MDPH regulations (*105 CMR 300.000*) stipulate that tetanus is reportable to the LBOH and that each LBOH must report any case of tetanus or suspect case of tetanus, as defined by the reporting criteria in Section 2A. Cases should be reported as soon as possible (24 hours a day, 7 days a week) to a MDPH immunization epidemiologist at the MDPH Division of Epidemiology and Immunization by calling (617) 983-6800 or (888) 658-2850. A MDPH immunization epidemiologist, in collaboration with the LBOH, will complete the Centers for Disease Control and Prevention (CDC) *Tetanus Surveillance Worksheet*. Cases will then be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).

Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Case Investigation

Due to national surveillance and reporting requirements, the MDPH will take the lead on tetanus case investigation (including filling out the official case report form) and case management recommendations, in collaboration with the LBOH. The MDPH will keep the LBOH informed of all significant developments and will request the assistance of the LBOH as needed.

In order to assess the likelihood that a suspect case is a true case, the MDPH and/or other public health staff helping in the investigation should ask about:

1. Clinical presentation;
2. Tetanus immunization history, including date of last booster dose;
3. Country of origin and length of residency in U.S.;
4. Military dates of service (if any);
5. Risk factors for disease, such as history of a wound or injury, chronic wounds (e.g., decubitus ulcer, diabetic ulcers), recent injection drug use, tattooing, or body piercing;
6. Occupations or hobbies involving contact with soil or manure; and
7. Treatment/prophylaxis with Td, TIG, or antibiotics.

For neonatal cases, ask about: a) maternal country of origin; and b) number of years of residence in the U.S.

Since tetanus is not transmitted from person to person, there are no routine control measures for a case of tetanus.



Section 4:

CONTROLLING FURTHER SPREAD

This section provides detailed recommendations. LBOH should familiarize themselves with the information. However, the MDPH will take the lead on implementing these measures, in collaboration with the LBOH.

A. Isolation and Quarantine Requirements (105 CMR 300.200)

None.

B. Protection of Contacts of a Case

Since tetanus is not transmitted from person to person, there is no immunization or prophylaxis necessary for contacts of a case. If the patient is hospitalized, use the occasion as an opportunity to assess the patient's immunization status, and follow standard precautions.

C. Managing Special Situations*Tetanus Prophylaxis in Routine Wound Management*

Appropriate immunization is central to tetanus prophylaxis. The need for active immunization (with Td) and/or passive immunization (with TIG) depends on the condition of the wound and the patient's immunization history:

	Clean, Minor Wounds		All Other Wounds ¹	
Tetanus Vaccination History	Td ²	TIG	Td ²	TIG
Unknown or <3 doses	Yes	No	Yes	Yes
≥3 doses	No ³	No	No ⁴	No

1 Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions; and wounds resulting from missiles, crushing, burns, and frostbite.

2 Td = the adult formulation of tetanus-diphtheria vaccine. TIG = human tetanus immune globulin. Use diphtheria-tetanus-acellular pertussis vaccine (DTaP) or diphtheria-tetanus vaccine (DT) for children <7 years of age. Use Td for those ≥7 years. (Tdap is an option for adolescents and adults.)

3 Yes, if more than ten years since last dose.

4 Yes, if more than five years since last dose.

Table adapted from: American Academy of Pediatrics. *2003 Red Book, Report of the Committee on Infectious Diseases, 26th Edition*. Illinois, American Academy of Pediatrics; 2003: 614.

Regardless of immunization status, dirty wounds should be properly cleaned and debrided, especially if dirt and/or necrotic tissue are present. Wounds should receive prompt surgical treatment to remove all devitalized tissue and foreign material as an essential part of tetanus prophylaxis. It is not necessary or appropriate to debride puncture wounds extensively.

Case Management

1. Wound care: All wounds should be properly cleaned and debrided, especially if extensive necrosis is present. In neonatal tetanus, wide excision of the umbilical cord is not indicated.
2. Human tetanus immune globulin (TIG, human): TIG is recommended for the treatment of tetanus. A single dose of 3,000–6,000 U is recommended for children and adults. The optimum therapeutic dose has not been

established. The preparation available in the U.S. must be given intramuscularly. Some authorities recommend infiltration of part of the dose locally around the wound, although the efficacy of this approach has not been proven.

3. Intravenous immune globulin (IGIV): IGIV anti-tetanus antibodies may be considered for treatment if TIG is not available. However, approval by the Food and Drug Administration (FDA) has not been given for this use, and the proper dosage has not been determined.
4. Antimicrobial therapy: Oral (or intravenous) metronidazole (30 mg/kg per day, given at 6-hour intervals; maximum 4 g/day) is the antimicrobial agent of choice and is effective in reducing the number of vegetative forms of *C. tetani* that are potentially present in a contaminated wound. Parenteral penicillin G (100,000 U/kg per day, given at 4- to 6-hour intervals; maximum 12 million U/day) is an alternative treatment. Therapy for 10–14 days is recommended.
5. Vaccination: Because disease does not result in immunity, administer Td (or for children less than seven years, DTaP, DT) if this was not done during wound management.
6. Supportive care and pharmacotherapy to control spasms are of major importance.

D. Preventive Measures

Personal Preventive Measures/Education

Vaccination, including routine childhood vaccination and Td boosters beginning at age 11–12 years and continuing every 10 years thereafter, is the best preventive measure against tetanus. Diphtheria toxoid-containing formulations should always be used. The Advisory Committee on Immunization Practices (ACIP) recommends that all children receive a routine series of 5 doses of diphtheria- and tetanus-containing vaccine at ages 2, 4, 6, 15–18 months, and 4–6 years. Booster doses of diphtheria- and tetanus-containing toxoids should then be administered beginning at age 11–12 years (provided at least 5 years have passed since the last dose) and every 10 years thereafter. Currently, DTaP and DT should be used in persons less than seven years of age, whereas Td is the preferred preparation for persons seven years of age or older. The Td catch-up schedule for those starting immunization at seven years of age or older consists of three doses. The second dose is usually given 1–2 months after the first dose, and the third dose is given 6 months after the second dose. Acellular pertussis vaccine formulations for adolescents and adults are licensed and combined with diphtheria- and tetanus-containing toxoids. The recommended schedule for TdaP has not yet been determined, but these combination vaccines should be acceptable in appropriate circumstances.

Health care providers and the public must be educated on the necessity of primary immunization with tetanus-diphtheria toxoid and ten-year booster doses, the hazards of puncture wounds and closed injuries, and the potential need after injury for active and/or passive prophylaxis. Because tetanus is preventable, each case should be considered a failure to vaccinate effectively and should be used as a means of determining how to prevent further failures from occurring. Surveillance information should be used to raise awareness of the importance of immunization and to characterize persons or places in which additional efforts are required to raise immunization levels and to decrease disease incidence.

For the prevention of neonatal tetanus, preventive measures (in addition to maternal immunization) include community immunization programs for adolescent girls and women of childbearing age and appropriate training of midwives in recommendations for immunization and aseptic technique and infection control.

Please refer to the *MMWR* Surveillance Summary on Tetanus, June 20, 2003 (listed under *References* section), the most current versions of MDPH's *Immunization Guidelines*, MDPH's model standing orders for diphtheria- and

tetanus-containing vaccine, and *Massachusetts Immunization Program State-Supplied Vaccines and Patient Eligibility Criteria* for recommended schedules, groups recommended, and groups eligible to receive state-supplied vaccine. These, as well as other relevant resources, are available through the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850, and on the MDPH website at www.mass.gov/dph/cdc/epii/imm/imm.htm#mso.

Environmental Measures

Sterilization of hospital supplies will prevent the infrequent instances of tetanus that may occur in a hospital from contaminated sutures, instruments, or plaster casts.



ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for tetanus. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Case Definition for Tetanus

Acute onset of hypertonia and/or painful muscular contractions (usually of the muscles of the jaw and neck) and generalized muscle spasms without other apparent medical cause.

Case Classification

Confirmed

A clinically compatible case, as reported by a health care professional.



REFERENCES

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FORMS & WORKSHEETS

Tetanus
(Also known as Lockjaw)

Tetanus

REPORT IMMEDIATELY

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LBOH Action Steps

This form does not need to be submitted to MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to tetanus case investigation activities.

LBOH staff should follow these steps when tetanus is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

Note: Due to national surveillance and reporting requirements, the MDPH will take the lead on tetanus investigations. This includes filling out the official case report form and making case management recommendations, in collaboration with the LBOH. The MDPH will keep the LBOH informed of all significant developments and will request the assistance of the LBOH as needed.

Reporting

- ☐ Immediately notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any confirmed or suspect case(s) of tetanus.

Case Investigation

- ☐ Work with MDPH to obtain the information necessary for completion of the case report form, including clinical information, vaccination history and any laboratory findings. (The MDPH will complete the form and will submit it to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services [ISIS].)
- ☐ Since tetanus disease does not result in immunity, tetanus toxoid (DTaP, DT, Td or Tdap) should be administered to the patient upon recovery (if it was not done during wound management).

Prevention and Control

- ☐ Since tetanus is not transmitted from person to person, there are no routine control measures for a case of tetanus. However, it is important to use this opportunity to ensure that all contacts are up-to-date for tetanus toxoid immunization.